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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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LSI CORPORATION 1621 BARBER LANE MS: D-106 MILPITAS, CA 95035			EXAMINER WERNER, DAVID N	
			ART UNIT 2621	PAPER NUMBER
			MAIL DATE 08/16/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/714,712

Applicant(s)

GALLANT ET AL.

Examiner

David N. Werner

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 May 2007.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-7,9-11,13-16 and 19-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-7,9-11,13-16 and 19-25 is/are rejected.
- 7) ☒ Claim(s) 13-16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 May 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. This Office action is in response to communications filed 31 May 2007, in reply to the First Action on the Merits, dated 28 March 2007. Currently, claims 1, 2, 4-7, 9-11, 13-16, and 19-25 are pending. In the previous Office action, claims 1-19 were rejected under 35 U.S.C. 101 for lacking utility, claims 1 and 11-18 were rejected under 35 U.S.C. 102(e) as anticipated by US Patent 6,473,460 B1 (Topper), claims 2-9 and 20 were rejected under 35 U.S.C. 103(a) as obvious over Topper in view of US Patent 6,380,986 B1 (Minami et al.), and claims 10 and 19 were rejected under 35 U.S.C. 103(a) as obvious over Topper in view of US Patent Application Publication 2002/0,176,500 A1 (Bakhmutsky et al.). In addition, the drawings and the specification were objected to on formalities. Claims 21-25 are new.

#### ***Drawings***

2. Replacement drawings were received on 31 May 2007. These drawings are accepted.

#### ***Response to Amendment***

3. Applicant's amendments to the specification have been fully considered. As the amendments overcome the objection to the specification based on formalities, these objections are withdrawn.

4. Applicant's amendments to the claims have been fully considered. As the amendments overcome the rejection to claims 1-19 under 35 U.S.C. 101 based on lack of utility, this rejection is withdrawn.

***Response to Arguments***

5. Applicant's arguments, see page 13, filed 31 May 2007, with respect to the drawings have been fully considered and are persuasive. The objection to the drawings as not illustrating every claimed feature has been withdrawn.

6. Applicant's arguments with respect to claims 1-20 under the prior art rejections have been considered but are moot in view of the new ground(s) of rejection.

***Claim Objections***

7. Claims 13-16 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a **previous** claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 13-16 currently depend on later claim 19.

Misnumbered claims 13-16 have been provisionally renumbered 26-29.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 10, 11, and 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent Application Publication 2000-308064 (Hanami et al.), relying on corresponding US Patent 6,765,965 B1 for translation. Hanami et al. teaches a motion vector detecting apparatus that divides a search into several parallel sub-units. Regarding claim 1, Figure 13 illustrates a configuration of the apparatus of Hanami et al. Regarding the memory, reference picture memories 41 and 42 store reference pictures (column 12: line 55–column 13: line 14). Regarding the two motion vector generating circuits, a plurality of motion detecting circuits MD #X each receive portions of the contents of reference picture memories 41 and 42 through buffers 43-48 (column 12: lines 10-24). The motion detecting circuits each generate a motion vector for a “template block” in a current frame. If the current frame is a P-frame, the motion detecting circuits search different offset windows of the same reference frame (column 10: line 65–column 11: line 25). Regarding claim 11, each motion detecting circuit MD #X copies a different search window of a reference image from one of the reference picture memories and generates a motion vector corresponding to the current template block from the appropriate search window.

Hanami et al. discloses the claimed invention except that in Hanami et al., pixel offsets for a reference frame are measured relative to a current macroblock, and in the present invention, pixel offsets for a reference frame are measured relative to a corner of the reference frame. However, it would have been obvious to one having ordinary

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skill in the art at the time the invention was made to set the origin of an offset measurement of a reference image from a corner of the reference image rather than a current macroblock, since the examiner takes Official Notice of the equivalence of determining an offset relative to **any** point in a given image for their use in measuring additional relative distances from said point. It would have been well within the level of ordinary skill of the art at the time the invention was made, for example, to determine the location of the current template block as an offset from a corner of the reference frame.

Regarding claims 10 and 23, in Hanami et al., if the current frame is a B-frame, two motion detecting circuits may search for motion vectors in a distant frame, and a third motion detecting circuit may search for a third motion vector in a near frame, as illustrated in figure 12. Note that the three search windows all have different offsets relative to the current template block (column 11: lines 26-57). Regarding claim 22, control circuit 55 controls all memory reads and writes for current picture memory 40, reference picture memories 41 and 42, and buffer memories 43-48 (column 14: line 8—column 15: line 55). Regarding claim 24, if the current picture is a B-picture, as illustrated in figure 7B, then the motion detecting circuits may be divided into two groups: group DGB, which performs backwards prediction, and group DGF, which performs forward prediction (column 9: lines 51-64). Regarding claims 21 and 25, if the current picture is a B-picture, then the search area for a reference picture more distant temporally from a current picture is wider, that is, with a larger offset from the current block, than the search area for a reference picture closer to a current picture, as the

more temporally distant picture may have a larger degree of motion from the current picture than does the more temporally close picture (column 11: lines 26-50).

9. Claims 2, 4-6, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanami in view of US Patent 6,445,645 B2 (Arcoleo et al). Regarding claim 2, figure 13 of Hanami et al. illustrates buffer memories 43-48 that copy selected references from the reference picture memories 41 and 42 (column 11: line 67–column 12: line 9). Each buffer stores only the reference data corresponding with the pixels for the search area for its corresponding motion detector circuit (column 13: lines 15-30), and so corresponds with the claimed “search memory”. Although Hanami et al. shows the buffers as separate components from the motion detector circuits, it would have been obvious to one having ordinary skill in the art at the time the invention was made to integrate these buffers with the motion detector circuits, since it has been held that forming in one piece an article which has been formerly been formed in two pieces and put together involves only routine skill in the art. See *Howard v. Detroit Stove Works*, 150 U.S. 164 (1893).

Although figure 13 of Hanami et al. demonstrates a set of lines connecting the buffer memories and the picture reference memories and a separate set of lines connecting the buffer memories and the motion detector circuits, applicant contends that this is not sufficient to demonstrate a write port separate from a read port in a memory. Arcoleo et al. teaches a random access memory with a separate read port and write port (abstract). Regarding claim 2, figure 2 of Arcoleo et al. illustrates an

embodiment of this invention. Data enters, or is written to, through bus DIN[17:0] (column 4: line 60), and leaves, or is read from, through bus DOUT[17:0] (column 5: line 41).

Hanami et al. discloses the claimed invention except, allegedly, a memory with a separate read port and write port. Arcoleo et al. teaches that it was known to provide a memory with an independent read port and write port. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide separate read and write ports to the buffers of Hanami et al., as taught by Arcoleo et al., since Arcoleo et al. states in column 1, lines 27-30 that such a modification would permit synchronous reading to and writing from the buffer.

Regarding claims 4-6, in Hanami et al., control circuit 55 includes buffer memory read control circuit 55f controls reading from and writing to the buffer memories (column 14: lines 32-35). Address generating circuit 55c generates addresses to read from the reference frame memory (column 15: lines 36-50), and reference picture memory read control circuit 55e performs the actual read from the memory (column 14: lines 28-31). Buffer memory read control circuit 55f generates addresses for reading from the buffer memory (column 15: lines 51-55). Claim 20 of the present invention is in proper means-plus-function format, and invokes 35 U.S.C. §112, sixth paragraph. Then the "means for searching" motion vectors and the "means for copying" reference samples from an external memory will be limited to a motion estimation processor circuit with a search memory and a control system, as described in the specification and shown in figure 4 of the present invention. Regarding claim 20, the motion detection circuits, buffer



memories, control circuit, and reference picture memories of Hanami et al., when the buffer memories are modified in accordance with Arcoleo et al. as described above, fully encompass the subject matter of claim 20.

10. Claims 7, 9, 13-16, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hanami et al. in view of European Patent Application Publication 1,143,712 A2 (Topper). In one embodiment of Hanami et al., one motion detecting circuit determines motion vectors for a different template block than the other motion detecting circuits (column 16: lines 16-22). However, the search areas for the different motion detecting circuits do not overlap (column 16: lines 37-39), and so do not meet the claimed requirement of the search range for the second block including a portion of the search range for the first block.

Topper discloses a motion estimation system in which overlapping blocks are searched. Regarding claims 7 and 19, in the motion estimation method of Topper, large 8 x 8 blocks are searched, and the best-match motion vector is applied to a 4 x 4 sub-block at the center of the large block (paragraph 0025). Then, the large block corresponds with the "reference samples" and the sub-block corresponds with the "current block". Multiple overlapping large blocks are searched. In the example illustrated in figure 3B, a second block 310 overlaps first block 218 by four pixels horizontally. The motion vector for block 218 is applied to sub-block 220, and the motion vector for block 310 is applied to sub-block 312 (paragraph 0027). In a further example, illustrated in figure 4B, a third block 410 overlaps first block 218 by four pixels

vertically. The motion vector for block 410 is applied to sub-block 412 (paragraph 0028).

Regarding claim 9 and claim 27 (originally claim 14), the portion of second block 310 or third block 410 that does not overlap block 218 is adjacent to block 218 (figure 4B). Regarding claim 26 (originally claim 13), sub-block 220 is adjacent to sub-blocks 312 and 412 (figure 4B). Regarding claim 28 (originally claim 15), each time a new field is received in a current field memory in Topper, the previous field is simultaneously transferred to a prior field memory, and a motion estimation processor generates motion vectors based on both the current field and the previous field (paragraph 0019). Regarding claim 29 (originally claim 16), the process of calculating a motion vector to the right of a given block is repeated for the entire width of an image (paragraph 0028). Once motion vectors are calculated for a whole row of blocks, the first motion vector for the next row of blocks, vertically overlapping the first row of blocks, begins. For each row of blocks, the motion vector of a block beneath a current block is calculated (paragraph 0029). Since this is an iterative row-by-row process, old reference blocks may be dropped as needed.

Hanami et al. discloses the claimed invention except for simultaneously searching for motion vectors for multiple blocks in overlapping search windows. Topper teaches that it was known perform multiple motion vector searches on overlapping areas of a frame. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Hanami et al. so that one of the motion detecting circuits would search for a motion vector for a second

block in a search window overlapping the search window used by the other motion detecting circuits searching for a motion vector for a first block, as taught by Topper, since it was well-known to one having ordinary skill in the art at the time the invention was made that performing two independent processes, such as motion vector searches for two macroblocks, simultaneously, produces a faster result than performing them sequentially. This result, and its limit in performance gain, is commonly known as Ahmdal's Law.

### ***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571) 272-9662. The examiner can normally be reached on Monday-Friday from 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DNW

*Mehrdad Dastouri*  
MEHRDAD DASTOURI  
SUPERVISORY PATENT EXAMINER  
TC 2600